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## THE ACTION OF ARSENICAL DIPS IN PREVENTING TICK INFESTATION

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During the summer of 1912 the writer conducted experiments relating to the action of arsenical dips in preventing cattle from becoming infested with cattle ticks. The data obtained at that time were published in Bulletin 167 of the Bureau of Animal Industry. The results showed that cattle dipped in an arsenical dip are protected for two full days from becoming infested with seed ticks, but not for five days. During the past summer experiments were undertaken to determine what protection, if any, such dipping offers for a period of three and of four days, and whether there is any mortality of ticks applied to and maturing on immune animals that have been subjected to a number of dippings at intervals of one and two weeks.

The dip employed was the usual arsenical dip used in this country in the tick eradication work in the South, containing 8 pounds of white arsenic to 500 gallons of dip, with the exception that the pine tar was omitted in order to exclude the possibility of the tar playing any part in the results by exercising a repellent action on the ticks.

Two experiments were carried out. In Experiment No. 1 cattle were exposed to infestation on the third and fourth days after dipping. Six calves non-immune to Texas fever were divided into three lots of two each. In the case of Lot No. 1 seed ticks were applied three days after dipping, and in the case of Lot No. 2 four days after dipping. Lot No. 3 was not dipped and served as a control. Seed ticks were applied to this lot on the same date as to Lot No. 1. After the seed ticks were applied the different lots were placed in separate paddocks which they occupied until the close of the experiment.

As a result of this experiment it was determined that animals dipped once in an arsenical dip containing sodium arsenite equivalent to 0.1863 per cent.  $\text{As}_2\text{O}_3$  were not protected from infestation when ticks were applied three days (Lot No. 1) and four days (Lot No. 2) after dipping. It was found, however, that the infestation of the dipped animals was light, whereas that of the two controls was heavy. It would therefore appear that dipping reduced markedly the degree of infestation. Since practically no dead nymphs were observed on the animals, it is evident that the lighter infestation of the dipped animals must have been brought about by an action on the larval stage,

which, as demonstrated in last year's experiments (Bulletin 157, Bureau of Animal Industry), is in the nature of a destructive action.

This experiment completes the work of last year, which demonstrated that cattle dipped in an arsenical dip such as used in this experiment are protected for two days, but not for five days, from infestation. The present experiment shows that the toxic action of the arsenic on and in the skin of dipped cattle is still effective to a certain degree on the third and the fourth day after dipping.

In Experiment No. 2 ticks were applied to animals five days after the last of four dippings at intervals of two weeks and of one week. This experiment was conducted primarily for the purpose of determining whether ticks that mature on animals that have been regularly dipped show any mortality after dropping off, due to arsenic absorbed from the skin of the animal.

Six immune calves divided into three lots of two each were used. Lot No. 1 was dipped four times at intervals of two weeks, Lot No. 2 four times at intervals of one week and Lot No. 3 remained undipped as a control. All the calves had ticks applied to them five days after the last dipping.

In the case of Lot No. 1, one of the calves acquired a heavy, the other a light infestation; whereas, in Lot No. 2, in which the animals were dipped at intervals but half as long, the animals became only very lightly infested. In the control (Lot No. 3) both animals became heavily infested with ticks. It is therefore seen that dipping animals four times at intervals of one and of two weeks will not protect them from becoming infested when ticks are applied five days after the last dipping. The degree of infestation did not appear to be reduced in the case of the animals dipped at intervals of two weeks (Lot No. 1), but in the case of those dipped at intervals of one week the infestation was reduced to a very marked extent. It is therefore seen that when the interval between dippings is two weeks there is no increment in the toxicity of the skin of cattle, whereas when the interval is one week there is an accumulation of arsenic from previous dippings sufficient to destroy some ticks and thus reduce the degree of infestation.

Large numbers of engorged ticks were collected from the dipped and the control animals and kept in the laboratory in Petri dishes. Observations were made on these with regard to mortality, oviposition, number of eggs deposited and the percentage of eggs hatching. It was found by comparison with the controls that the ticks from the dipped animals manifested no abnormality. In other words, it may be said that ticks placed on animals five days after the last of four dippings, at intervals of one week and of two weeks, and permitted to engorge show no indication of arsenical poisoning.